

### Success Criteria

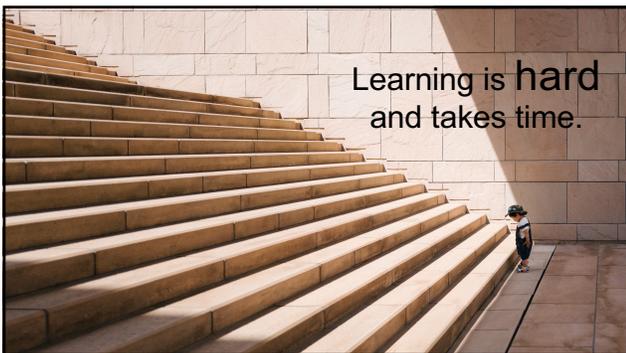


- I can explain key principles of how my students learn.
- I can recognize strategies that apply these principles to learning in my classroom.
- I can create learning opportunities for my students that integrate these principles into my classroom.



- Direct Instruction
- Note-Taking
- Summarizing
- Vocabulary Instruction
- Spaced Practice
- Concept Mapping
- Reciprocal Teaching
- Class Discussion
- Self-Questioning
- Identifying Similarities and Differences
- Problem-Solving Teaching
- Extended Writing
- Peer Tutoring
- Debates/Formal Discussions

Hattie & Donoghue, 2016



Option #1	Option #2
<p>Complete the following:</p> <p><math>1 + 5 = ?</math>  <math>2 + 4 = ?</math>  <math>3 + 3 = ?</math>  <math>4 + 2 = ?</math>  <math>5 + 1 = ?</math></p>	<ol style="list-style-type: none"> <li>Choose any number between 2 and 9.</li> <li>Add it to itself and record your answer.</li> <li>Then, increase your chosen number by one and decrease your chosen number by one.</li> <li>Add the two resulting numbers. What do you notice?</li> </ol>

Hattie, Fisher, and Frey, 2017

Option #1	Option #2
<p>Order the following fractions by first finding a common denominator.</p> <p><math>19/15</math>      <math>11/15</math>  <math>7/12</math>        <math>41/30</math>  <math>5/6</math>          <math>1/2</math></p>	<ol style="list-style-type: none"> <li>Predict where you think <math>11/8</math> should be on the below number line.</li> <li>Explain why you placed <math>11/8</math> where you did.</li> <li>Draw and label a few other points to help you explain your reasoning.</li> </ol> 

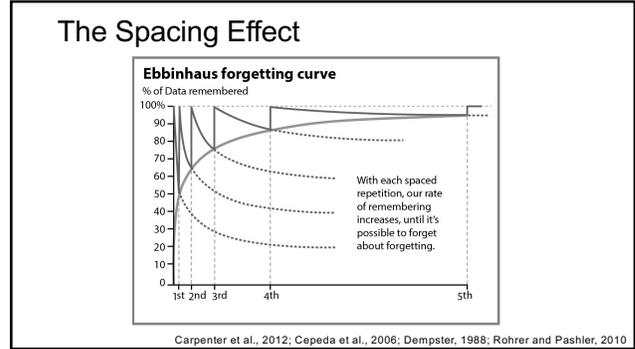
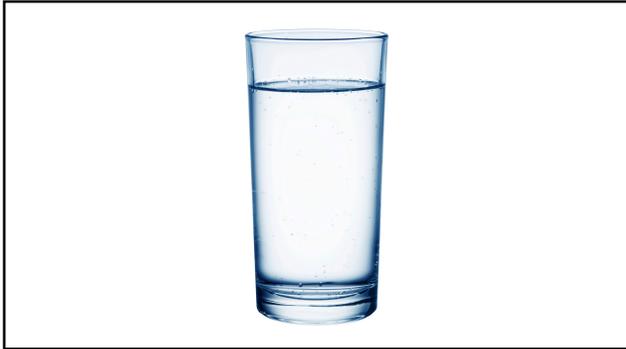


## Representation Patterns Emotion

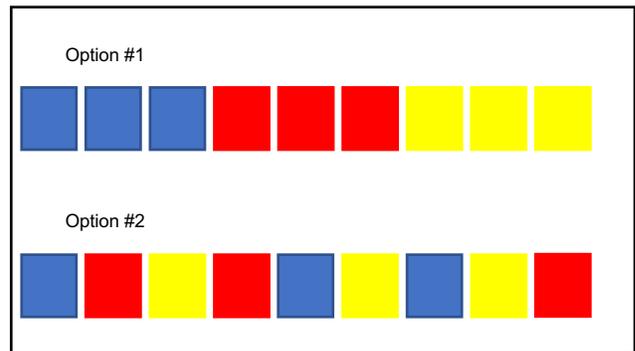
Medina, 2008

### Retrieval Practice/Testing Effect

- Instead of repeated **restu**\_\_\_\_\_g, learners are far better off **tes**\_\_\_\_\_g themselves, both early and often (Roediger & Karpicke, 2006).
- The act of **retr**\_\_\_\_\_l is a memory **modi**\_\_\_\_r. Whatever **infor**\_\_\_\_\_n is **retr**\_\_\_\_d becomes strengthened (Bjork, 1975).
- With **fee**\_\_\_\_\_k, either by seeing the answers or **rev**\_\_\_\_\_g the information, the benefits of **tes**\_\_\_\_\_g become even more powerful (Hayes et al., 2010; Pashler et al., 2005).
- For **mult**\_\_\_\_\_e – **ch**\_\_\_\_\_e questions, have students justify why a particular answer is **cor**\_\_\_\_\_t and why other answers are **incor**\_\_\_\_\_t (Chan et al., 2006; Little et al., 2012).
- When material is studied over **sev**\_\_\_\_\_l **sess**\_\_\_\_\_s and tested in a new context, **var**\_\_\_\_\_g the contexts of study results in **be**\_\_\_\_\_r **perf**\_\_\_\_\_ce (Smith et al., 1978; Smith & Vela, 2001).



- ### Make Student Thinking Visible
1. Ask students to ob\_\_\_\_\_ and de\_\_\_\_\_ what they "see" in wor\_\_\_\_\_d ex\_\_\_\_\_s.
  2. Build ex\_\_\_\_\_ and int\_\_\_\_\_ associated with solutions.
  3. Re\_\_\_\_\_ or support their so\_\_\_\_\_n or ap\_\_\_\_\_h with ev\_\_\_\_\_.
  4. Make co\_\_\_\_\_ to authentic scenarios.
  5. Consider different v\_\_\_\_\_ and pe\_\_\_\_\_.
  6. Capture the big i\_\_\_\_\_ and form co\_\_\_\_\_.
  7. Promote inquiry or the a\_\_\_\_\_ of more q\_\_\_\_\_.
  8. Uncover the co\_\_\_\_\_ by going below the s\_\_\_\_\_.
- Ritchhart, Church, and Morrison, 2011



Option #1: Blocking



Option #2: Interleaving



Birbaum et al., 2013; Kang and Pashler, 2012; Kornell and Bjork, 2008; Rohrer, 2012; Taylor and Rohrer, 2010

### Desirable Difficulties

1. A study **st**\_\_\_\_\_y which makes it appear that you are **le**\_\_\_\_\_g quickly now will likely not support your **ab**\_\_\_\_\_y to **rem**\_\_\_\_\_r the information later (Yan, Clark, & Bjork, 2017).
2. The most robust techniques for **l**\_\_\_\_\_g - **t**\_\_\_\_\_m **le**\_\_\_\_\_g are referred to as **de**\_\_\_\_\_e **dif**\_\_\_\_\_s (Bjork, 1994).
3. For the very same reason that these **str**\_\_\_\_\_s are effective, learners and educators alike judge them to be **ine**\_\_\_\_\_e and **inef**\_\_\_\_\_t (Yan, Clark, and Bjork, 2017).
4. There is a difference between **perf**\_\_\_\_\_e and **le**\_\_\_\_\_g.
5. However, it is not the **st**\_\_\_\_\_y that leads to **l**\_\_\_\_\_g - **t**\_\_\_\_\_m **le**\_\_\_\_\_g, but rather the **cog**\_\_\_\_\_e **pro**\_\_\_\_\_s which are engaged by these strategies (Bjork & Bjork, 2014).

